Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2002 Proceedings

Americas Conference on Information Systems (AMCIS)

December 2002

EXPLODING PHONES AND DANGEROUS BANANAS: PERCEIVED PRECISION AND BELIEVABILITY OF DECEPTIVE MESSAGES FOUND ON THE INTERNET

Stefano Grazioli
University of Virginia

Ronald Carrell
University of Virginia

EXPLODING PHONES AND DANGEROUS BANANAS: PERCEIVED PRECISION AND BELIEVABILITY OF DECEPTIVE MESSAGES FOUND ON THE INTERNET

Stefano Grazioli
McIntire School of Commerce
University of Virginia
grazioli@virginia.edu

Ronald C. Carrell
McCombs School of Business
University of Texas at Austin
rcarrell@mail.utexas.edu

Abstract

Urban legends are untrue messages that circulate widely in a social environment and that have a wide audience that believes them to be true. We argue that the Internet facilitates the spreading of these deceptive messages and that in some cases this carries with it social and managerial consequences. We contribute to current research on dysfunctional forms of communication by showing that targets of deceptive messages judge lower-precision messages to be untruthful, and that some (but not all) targets use higher precision as a proxy for truth. Overall, these results caution us not to use precision as a proxy for truth when evaluating reports and rumors such as those that flood Internet mailboxes and chat rooms.

Introduction

Urban legends are narratives that (a) originate and spread anonymously or semi-anonymously, (b) are often found in several versions, (c) have a wide audience, and (d) are believed by many to be true despite the lack of supporting evidence or despite the existence of clear contradictory evidence (Brunvand 2000; Heath, et al 2001). Examples of urban legends include reports of alligators inhabiting city sewer systems, razor blades being placed inside apples, phones that cause explosions, and bacteria-laden bananas. Google and the Open Directory Project,[1] as well as dozens of other web sites,[2] contain hundreds of examples of such narratives.

Although urban legends predate the Internet, we argue that the Internet is a particularly fertile terrain for this type of dysfunctional form of communication, and that the spreading of urban legends is not without consequence. Urban legends are often believed to be true by relatively sophisticated and well-educated individuals (Brunvand 2000). In the medical field, for instance, they have become so common that the *Center for Disease Control and Prevention* (CDC – the federal agency responsible for protecting the health and safety of the American public) features a link on its web homepage to a location exclusively dedicated to debunking Internet "Hoaxes and Rumors." At present, the CDC lists 11 medical urban legends, including the dangerous-banana story that inspired the title of this paper. In this particular urban legend, it is reported that eating bananas from Costa Rica causes *necrotizing fasciitis*, an illness sometimes characterized as "flesh-eating bacteria." While *necrotizing fasciitis* is a real and serious disease (the CDC reports that it destroys muscle, fat, and skin tissue, and can lead to death), the claim that we can contract it from Costa Rican bananas does not have a scientific basis.

Lack of factual basis notwithstanding, the rumor about these dangerous bananas was widespread enough to induce the International Banana Association – the trade organization that represents companies engaged in the business of importing bananas into the United States – to issue a press release designed to quench public fears and sustain demand for the product. The release

[1]http://dmoz.org/about.html.

[2]Including, http://www.hoaxbusters.com, http://www.scambusters.org, and http://www.urbanlegends.com.

stated "while the Internet offers users many benefits, there are clearly drawbacks in its ability to disseminate misinformation quite rapidly to the general public."[3]

This paper examines one of the factors that influences the believability and ultimately the diffusion of deceptive untrue messages. We argue that this factor – namely a message's perceived precision – may be used frequently as a diagnostic for assessing the believability of Internet messages because message receivers on the Internet do not have available to them many of the verbal and nonverbal indicators of deceptiveness that characterize face-to-face communications (e.g., Vrij 2000).

We begin our study by identifying common characteristics of urban legends, as well as characteristics of Internet technology that facilitate their diffusion. We then identify perceived precision as one of the factors that affects the believability of a deceptive message, and we propose hypotheses that describe the relationship between perceived precision and believability. Data on urban legends that have appeared on the Internet in recent years are then used to test the hypotheses. Limitations and implications of the results conclude the paper.

Literature Review and Theory

During the last forty years, researchers interested in the study of deceptive communications have produced a significant amount of research, albeit scattered throughout several disciplines. The state of the art in organizational communication has been overviewed in several outlets, including the recently published *Handbook of Organizational Communication* (Jablin and Putnam 2001). Vrij (2001) has focused on surveying the work done by psychologists and cognitive scientists.[4]

A growing body of literature exists regarding urban legends (e.g., Brunvand 2000). Specifically, research has found that the origin and authorship of an urban legend is generally hard to identify, and that those who circulate these narratives often contribute to their development by adding or changing details and endorsements.

The audience of urban legends is by definition wide and includes well-educated, well-informed individuals (Brunvand 2000). Recipients are often told that there is a short and direct line of informants between them and the facts described in the message ("This happened to one of my husband's coworkers…"). Other times, they are told that the message is an excerpt from a news media report.

Urban legends cover a large variety of topics. They range from the dangers of using common products (cell-phone use causing a gas-station explosion while fueling one's car - see Figure 1), to criminal conspiracies (flashing one's car lights can lead to being shot by gang members as part of a gang initiation ritual), to health threats (the poisonous bananas). One common thread is that these narratives have a hyperbolic component, i.e., an ironic, grotesque, or extraordinary twist that makes them captivating and memorable (Brunvand 2000). Urban legends are often strongly prescriptive: "do not use that product," "do not go to that place," or "do not perform that action."

As an example of the adverse business consequences that can arise from a widely circulated urban legend, consider the case of *Procter and Gamble*. For many years various urban legends have associated P&G and its distinctive company logo with satanic cults and practices. P&G management deemed these rumors so potentially damaging that they filed at least two lawsuits against competitors accused of circulating "rumors which falsely and maliciously associated P&G and its products with Satan."[5] These lawsuits have cost the involved parties tens of millions of dollars (Houston Chronicle 2001). P&G also claims that during the period from 1980-1995 it answered approximately 200,000 calls and letters about the rumors.

---

[3]http://www.eatmorebananas.com/press/ November 2000.

[4]One of our reviewers also recommended the review by Porterfield (1974) as a brief overview of the early works on the topic.

[5]http://www.pg.com/news/ July 17 1997.

Urban Legends and the Internet

Grazioli and Jarvenpaa (2000) have argued that the specifics of Internet technology facilitate the creation and spread of deceptive information on the Internet. Here we extend that line of reasoning and argue that the Internet facilitates the diffusion of urban legends especially when compared to the traditional word-of-mouth diffusion mechanism. There are several reasons that support this argument: (1) the Internet offers mechanisms for the circulation of documents, especially via email and linking. (2) The Internet facilitates anonymous postings. (3) The Internet facilitates the creation of false identities for the writers of these deceptive messages. (4) The Internet offers an extended reach to wide audiences. (5) The Internet eases the reuse of received documents via copying, editing and resending. (6) The Internet has increased the speed at which these messages are circulated. (7) The Internet may positively affect the credibility of the messages it carries in subtle ways (e.g., by allowing people to "pull" a deceptive message from a site rather than by having it "pushed" onto them, or by multiplying the sources from which a deceptive message is received).

The bad news is that the Internet appears to be an ideal vehicle for the spreading of urban legends. The good news is that the very same technology that facilitates the creation and spread of these deceptive messages may also offer tools for debunking and containing them, as more and more Internet sites offer assessments of the believability of these messages, as well as forums for discussing them.

Determinants of Urban Legend Success

The biologist Richard Dawkins (1976) has likened the diffusion and survival of ideas[6] to the diffusion and survival of genes. He suggested that ideas in a social environment undergo the same basic processes that characterize proposed evolutionary mechanisms: selection, retention, and variation.

Dawkins' analogy nicely fits here. The Internet is the social environment where urban legends diffuse and survive. Selection is implemented in the recipient's choice to delete an email containing an urban legend or to forward it, post it, or hyperlink to it. Retention is achieved by simply storing the text on the network. Variation is obtained when a recipient edits an urban legend before re-posting or forwarding it to others.

To explain which urban legends survive and propagate in a social environment, Heath and his colleagues (2001) have recently proposed that urban legends succeed based on their "informational value" (i.e., being perceived as true, as having a moral lesson), as well as their "emotional value" (i.e., being able to evoke fear, anger, or disgust). Their elegant series of empirical studies demonstrates that emotional value is indeed a determinant of urban legend success.

In this paper we examine the informational value of urban legends, and in particular we focus on *precision* as one of the determinants of their believability. A considerable body of research that has focused on what makes a message believable or persuasive (e.g., Petty and Cacioppo 1984, 1983). Researchers commonly group the factors that make a message persuasive into four elements: (1) message characteristics such as precision, (2) source characteristics such as credibility, (3) target characteristics such as skill and knowledge, and (4) situational factors such as costs and benefits (O'Keefe 1990, Fiske and Taylor 1991).

Precision as a Determinant of the Believability of a Deceptive Message

Our definition of verbal precision is rooted in research on numerical precision (e.g., Olson and Budescu 1990; Mayer 1993; Wise 1995; Youden 1969; Murphy 1969). We define verbal precision as a message's *breadth of meaning*. For instance, the phrase "U.S. president" is more precise than the phrase "world leader" because the former has a narrower range of meaning.

Researchers have approached verbal precision in various ways, most of which have revolved around the detail or specificity of a message. Bell and Loftus (1988 1989), for instance, created scenarios that manipulated precision level largely by using proper nouns (e.g., "Milk Duds") and by specifying objects and their characteristics (e.g., color). Stiff and Miller (1986) counted adjectives and adverbs. Viswanathan (1997) measured precision in terms of an "exact idea of opinions," "narrow categories," and "slightly different alternatives." A similar, commonly used measure is message length (Vrij 2000).

---

[6]He referred to them as "memes."

Experimental studies of the effect of precision on persuasion have in fact demonstrated that precise messages have a persuasive effect (Wells and Leippe 1981; Bell and Loftus 1988,1989). This effect might arise because people tend to infer overall memory accuracy of a source from the source's ability to recollect precise details, even if these details are relatively marginal. An additional explanation is that precision may be interpreted as a sign that the sender possesses superior knowledge.

A precise false message has, however, a specific downside. A more precise false message is often easier to detect than a less precise message because the added precision contains information that can be disproved or that can raise suspicion. For example, messages that are more precise are more likely to violate subjects' expectations about message content. Violated expectations are key mechanisms to initiate detection of deception (Johnson, et al 1992, 2001; Grazioli and Wang 2001).

Thus, it appears that precision both increases and decreases a deceptive message's chance of being believed. We call this effect "*the deceiver's curse*." From the standpoint of the deceiver, increasing precision is desirable because it has a persuasive impact, but it is also dangerous because it exposes more elements that are falsifiable or that can raise suspicion.[7] The idea of a deceiver's curse is not entirely new. Yaniv and Foster (1995 1997) identified a somewhat similar *accuracy-informativeness tradeoff*. This tradeoff applies to truthful communication and refers to the need to provide a balance between accuracy and precision in a message.

We are now in a position to formulate hypotheses that summarize this discussion:

H1: Perceived precision increases believability of a deceptive message.

This hypothesis is consistent with the cited literature. Now, though, we move beyond the current literature and propose that perceived precision has an asymmetric effect on believability. Specifically, we hypothesize that low levels of perceived precision lead to low believability of a message, but that high levels of precision do not necessarily lead to high believability. In other words,

H2: At low levels of perceived precision, the believability of a message decreases when perceived precision decreases, and

H3: At high levels of perceived precision, the believability of a message does not depend on perceived precision.

The next section examines the validity of these hypotheses.

Method

Subjects. To test the proposed hypotheses we conducted a study with business undergraduates enrolled in a management course at a large public university. As an incentive, participants were offered extra class credit. In addition, the material to be examined is fairly entertaining.

Task. Subjects were asked to participate in a "Business Intelligence" exercise and to take the role of decision makers who need to quickly react to potentially business-relevant "reports" found on the Internet. Participants were given five such reports and were asked to rate their precision and believability.

The five reports were five urban legends selected from Internet repositories based on length and content. One report involved the dangers of using cell phones while pumping gasoline (see Figure 1). A second involved frivolous litigation. Another suggested a procedure by which one could avoid having fines entered on one's driving record. Two more reports alerted consumers to the dangers of specific household products. Their length varied from 81 to 242 words. The reports were given to the subject in the order in which they are presented in Table 1.

[7]Of course, a deceiver might try to have it both ways by increasing detail of an irrelevant aspect of a narrative.

Mobile phones are an explosive risk at gas stations. Switch off your mobile phone while filling your car. This is the latest advice for mobile phone users and gas station attendants alike from the Chinese Petroleum Corp. (CPC), which has recently informed all its affiliates to be on alert for people chatting on mobiles while pumping gas, a practice it asserts can cause explosions. "There have been several explosions in Southeast Asia and Europe and we hope similar tragedies can be avoided in Taiwan," said David Tung from CPC's main engineering division.

According to a report released by Shell Chemicals, a driver in Indonesia suffered burns and his car was severely damaged when petrol vapor exploded after being ignited by static electricity from the mobile phone he was using.

Apparently, the driver had been talking on a mobile phone as a gas station attendant filled his car with petrol. When the driver bent down close to the petrol tank to check whether it was full, the vapor exploded. The threat mobile phones pose to gas stations and their users around the world is largely due to their ability to produce sparks. These can be generated by the high-powered battery inside the phone, which is itself a possible cause of fire. However, the electromagnetic waves emitted by the phone are more than sufficient to create considerable static electricity that heats the surrounding air and, if the flammable vapor is concentrated enough, causes an explosion.

Figure 1. One of the Reports Given to Study Participants

Measures. Believability was assessed by means of three items: for each report, subjects were asked to assess their agreement (from 1 = strongly disagree to 7 = strongly agree) with statements that the report was "true," "based on real facts," and "correct." These are the wordings commonly used in studies of believability. Perceived precision was assessed by means of three items, also. Subjects were asked to assess their agreement with statements that the report was "precise," "clear-cut," and "specific." As control variables, we employed gender as well as other demographic data (e.g., whether English was the subject's native language). We also asked participants whether they had seen the report "covered elsewhere."

Findings

Of the 52 participants (14 males and 38 females), 90.4% were native English speakers. They all completed the exercise, which gave us 260 observations (= 52 subjects x 5 reports). Construct reliability for perceived precision and believability measured by Cronbach's alpha were respectively 0.76 and 0.90.

Table 2 shows the means and standard deviations of perceived precision and believability for each of the five reports. For all reports, the mean believability was 3.1 (the midpoint of the scale is 4.0), which suggests that on average the subjects did not believe the reports given to them. However, more detailed analysis reveals that 10% of the subjects assigned a believability score equal or larger than 5.0 for at least one report. These results are consistent with the suggestion that even relatively well-educated, young audiences may fall prey to urban legends found on the Internet.

Table 1. Mean Perceived Precision and Believability of Five Urban Legends

MEASURES	URBAN LEGEND ("REPORT")					ACROSS ALL URBAN LEGENDS ("REPORTS")
	Exploding Phones	**Cigar Lawsuit**	**Sun screen**	**Drivers License**	**Tooth paste**	
Mean Precision (SD)	4.18 (1.33)	3.77 (1.37)	4.36 (1.17)	4.44 (1.37)	4.32 (1.34)	4.21 (1.33)
Mean Believability (SD)	2.56 (1.26)	3.49 (1.51)	2.98 (1.42)	3.39 (1.72)	3.14 (1.54)	3.11 (1.52)

In 28 instances (11%), subjects reported that they had already seen the topic of the report covered elsewhere. As expected prior exposure correlates positively with both their judgment that the report is true and that it is precise. The correlation coefficient of previous exposure to the topic with believability is 0.41 ($p < 0.000$) and with perceived precision is 0.21 ($p = 0.001$). We will control for this factor throughout our analysis. Other controls (e.g., gender, class grade, English as first language) did not have much effect.

Test of hypothesis H1. To test whether perceived precision increases believability of a message we regressed believability (dependent) on perceived precision (independent), subject (dummy), and previous exposure (control). The beta coefficient of perceived precision was large, positive, and highly significant. We therefore accept hypothesis H1 (see Table 2).

Test of hypothesis H2. H2 and H3 articulate in more detail the general result obtained by H1 and establish boundaries for its validity. To test whether at low levels of perceived precision the believability of a message decreases when precision decreases, we ran a second regression focusing only on instances where the subjects evaluated the reports as having low precision. Arbitrarily, we picked a level of 3 or less as the operational definition for low precision.[8] 63 instances, or 24% of the available observations, satisfied the definition.

For this subset of the data, we regressed believability on perceived precision (independent) and previous exposure (control). The beta coefficient of perceived precision is positive, significant, and virtually identical to the one obtained in the previous regression. As an additional analysis, we computed the mean believability assigned to these messages and found it to be 2.21 (s.d. = 1.14), which is significantly less than the arbitrary cutoff point (precision = 3) that we selected to determine whether a subject believes that a report is untrue (p=0.000 - See footnote 8). We therefore accept hypothesis H2 (see Table 2).

Test of hypothesis H3. To test whether at high levels of perceived precision the believability of a message does not depend on precision, we computed a third regression. This time we considered only instances where subjects indicated a level of precision higher than or equal to 5 (n = 103, 40% of the available observations). As expected, the coefficient of perceived precision was *not* statistically significant (p= .273).

Table 2. Regression Results

Hypothesis	**Regression Standardized Coefficients (betas)**		**P**	**Adj. R^2**	**Result**
H1: Perceived precision increases believability of a deceptive message	Constant Precision Prior knowledge Subject[a]	 .349 .392 --	n.s. .000 .000 --	0.39	Accepted
H2: At low levels of perceived precision, the believability of a message decreases when perceived precision decreases	Constant Precision Prior knowledge	 .348 .217	n.s. .004 .067	0.17	Accepted
H3: At high levels of perceived precision, the believability of a message does not depend on perceived precision	Constant Precision Prior knowledge	 .104 .308	n.s. n.s. .001	0.08	Non significant (as expected)

[a]To account for subject variability we introduced in the regression 51 Boolean variables (one per subject minus one). Their coefficients are not reported. Taking these regressors out of the regression model does not materially change the results.

The lack of a linear relation between precision and believability shown in this last analysis is not explained by saying that subjects could not make up their mind, and assigned an uncommitted 4 (midpoint) believability value to the reports. In 30 (29%) of the 103 high-perceived precision cases, the subjects assigned a believability of five or more, suggesting that they believed the report. In 34 (31%) cases, the subjects assigned a believability of three or less, suggesting that they did not.[9]

[8]Choosing the mean, median, or the scale mid-point (4) make the results even stronger.

[9] Correcting for previous exposure to the topic does not change the results.

Limitations

A limitation of the study is that the order of the administration of the reports to the participants was fixed. This restricts our capacity to make inferences on the effects of the individual reports, since they could be confounded with possible learning and/or sequencing effects. As a partial way to test for possible order effects, we compared the mean precision and believability assigned to the first three reports with the mean precision and believability assigned to the last two reports. There were no statistically significant differences between the two groups ($p = 0.13$, $p = 0.26$).

A second limitation is that we did not thoroughly examine the validity of the believability and precision constructs. In constructing our items we relied on suggestions and ideas that we gleaned from our extensive analysis of the available literature on precision. For these reasons the results from the study should be considered only suggestive.

Conclusions and Contribution

This study examines responses to deceptive messages found on the Internet. Understanding the responses to such deceptive information is important because of their possible consequences. For example, it is known that deceptive reports have materially affected the course of the market of specific securities.

Our results suggest that at least in asynchronous settings deceivers may choose to lie with precision, even though the specifics provided by precision may fuel the deceiver's curse (less precision and you are not believed, more precision and you are exposed…). Furthermore, the study suggests that the perception of precision is a necessary but not sufficient requirement for the perception of believability of an untrue report. As a result, these findings lead us to question the assumption often made by targets that precision is a proxy for truthfulness. In so doing, it sends a healthy warning to decision-makers who evaluate the believability of reports and rumors such as those that often flood Internet mailboxes and chat rooms.

The well-established Elaboration Likelihood Model of persuasion (Petty and Cacioppo 1986) emphasizes the existence of two routes to process a message's information and determine its believability. The first is the "systematic" route, and is based on careful analysis of message content. The second is the "peripheral" (heuristic) route, and uses superficial clues such as attractiveness, expertise and likeability of the source to determine message believability. A considerable amount of research has shown that when people choose the first route, they can distinguish strong arguments from weak ones, while when they chose the second, their ability to evaluate the content of a message is impaired. Our results with deceptive messages (an arena where the ELM has been seldom applied) are compatible with that stream of research. In plainer terms, our data emphasize the need to think hard before accepting a message as true, even if it is precise. Many of our subjects fell for the deceptively precise reports we asked them to evaluate.

The argument and the empirical results presented here have two main implications for future research. The first is that we need to better identify conditions under which a deceiver may choose to use precision in a message. The second is to identify conditions and interventions designed to facilitate detection of deceptive messages that are precise.

References

Bell, B. E., and Loftus, E. F. (1988). Degree of detail of eyewitness testimony and mock juror judgments. *Journal of Applied Social Psychology*, *18(14)*, 1171-1192.

Bell, B. E., and Loftus, E. F. (1989). Trivial persuasion in the courtroom: The power of (a few) minor details. *Journal of Personality and Social Psychology*, *56(5)*, 669-679.

Brunvand, J. H. (2000). *The truth never stands in the way of a good story.* Urbana, IL: Univ. of Illinois Press.

Dawkins, R. (1976). *The selfish gene.* NY: Oxford University Press.

Fiske, S.T., and Taylor S.E. (1991). *Social Cognition.* NY: McGraw-Hill.

Grazioli, S., and Jarvenpaa S. (2000). Perils of Internet fraud. *IEEE Transactions on Systems, Man, and Cybernetics*, *30(4)*, 395-410.

Grazioli, S., and Wang, A. (2001). Looking without seeing: Understanding naïve consumers' success and failure to detect Internet deception. *Proceedings of the International Conference on Information Systems*, New Orleans 193-204.

Heath, C., Bell, C., and Sternberg E. (2001). Emotional selection in memes: The case of urban legends. *Journal of Personality and Social Psychology, 81(6)*, 1028-1041.

Jablin, F. M., and Putnam, L. L. (2001). *The new handbook of organizational communication: Advances in theory, research, and methods.* Thousand Oaks, CA: Sage Publications.

Johnson, P. E., Grazioli, S., Jamal, K., and Berryman, G. R. (2001). Detecting deception: Adversarial problem solving in a low base rate world. *Cognitive Science*, *25(3)*, May/June, 355-392.

Johnson, P. E., Grazioli, S., Jamal, K., and Zualkernan, I. A. (1992). Success and failure in expert reasoning. *Journal of Organizational Behavior and Human Decision Processes*, *53(2)*, 173-203.

Mayer, T. (1993). *Truth versus precision in economics*. Cambridge: University Press.

Murphy, R. B. (1969). On the meaning of precision and accuracy. In H. H. Hu (Ed.), *Precision measurement and calibration: Selected NBS papers on statistical concepts and procedures*, NBS Special Publication 300 B Vol. 1, 357-360. Washington, D.C.: U.S. Government Printing Office.

O'Keefe, D.J. (1990). *Persuasion: Theory and research*. Newbury Park, CA: Sage Publications.

Olson, M. J., and Budescu, D. V. (1997). Patterns of preference for numerical and verbal probabilities. *Journal of Behavioral Decision Making*, *10*, 117-131.

Petty, R. E., and Cacioppo, J. T. (1984). The effect of involvement on responses to argument quantity and quality: central and peripheral routes to persuasion. *Journal of Personality and Social Psychology, 46*, 69-81.

Petty, R. E., and Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change* (Springer series in social psychology). NY: Springer-Verlag.

Petty, R. E., Cacioppo, J. T., and Schumann, D. (1983). Central and peripheral routes to advertising effectiveness: The moderating role of involvement. *Journal of Consumer Research, 10(2)*, 135-147.

Porterfield, C.D. (1974). Organizational communication: Developments from 1960 to the present. *The Journal of Business Communication*, *11(4)*, 18-24.

Stiff, J. B., and Miller, G. R. (1986). "Come to think of it . . . Interrogative probes, deceptive communication, and deception detection. *Human Communication Research*, *12(3)*, Spring, 339-357.

The Houston Chronicle (2001). *High court favors P&G over Amway. Protected commercial speech unclarified*. October 2, 5.

Viswanathan, M. (1997). Individual differences in need for precision. *Personality and Social Psychology Bulletin*, *23(7)*, 717-735.

Vrij, A. (2000). *Detecting lies and deceit: The psychology of lying and the implications for professional practice*. NY: John Wiley and Sons.

Wells, G. L., and Leippe, M. R. (1981). How do triers of fact infer the accuracy of eyewitness identifications? Using memory for peripheral detail can be misleading. *Journal of Applied Psychology*, *66*, 682-687.

Wise, M. N. (1995). *The values of precision*. Princeton, NJ: Princeton University Press.

Yaniv, I., and Foster, D. P. (1995). Graininess of judgment under uncertainty: An accuracy-informativeness trade-off. *Journal of Experimental Psychology: General*, *124*, 424-432.

Yaniv, I., and Foster, D. P. (1997). Precision and accuracy of judgmental estimation. *Journal of Behavioral Decision Making*, *10*, 21-32.

Youden, W. J. (1969). How to evaluate accuracy. In H. H. Hu (Ed.), *Precision measurement and calibration: Selected NBS papers on statistical concepts and procedures*, NBS Special Publication 300 B Vol. 1, 361-364. Washington, D.C.: U.S. Government Printing Office.